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Re: Comments on the Sustained Yield Plan/Habitat Conservation Plan for the properties of The Pacific Lumber Company (et al.), Public Review Draft July 1998.

1) Introduction and Qualifications

My name is Christopher A. Frissell. I am a Research Associate Professor at The Flathead Lake Biological Station of The University of Montana, specializing in the fields of freshwater ecology and conservation biology of fishes and other aquatic biota. My credentials for evaluation of the Pacific Lumber Company et al. Sustained Yield Plan and Habitat Conservation Plan (SYP/HCP) include an undergraduate degree in Zooology from The University of Montana, M.S. and Ph.D. degrees in Fisheries Science from Oregon State University, and 15 years of research experience as a faculty member of Oregon State University and The University of Montana. A curriculum vitae is attached for reference.

My doctoral dissertation concerned the impacts of land use on salmon habitat and salmon conservation in south coastal Oregon, at the northern edge of the Klamath Mountains region with geological, climatic, and biological features very similar to those in the area covered by the SYP/HCP. This research concerned coho salmon and other anadromous page two

salmonid species. I have conducted research on salmonid fish ecology and habitat conservation in watersheds of many other areas, including coastal Oregon and Washington and interior regions of the Pacific Northwest and northern Rocky Mountains. I have published numerous peer-reviewed articles and book chapters in the fields of stream habitat classification and assessment, and the endangerment, conservation and restoration of salmonid fishes and their habitats in the Pacific Northwest and Intermountain regions. In addition, I have reviewed dozens of environmental impact statements, restoration plans, and habitat conservation plans affecting threatened and endangered fishes and other species of concern in coastal and interior areas over the past 18 years. As a member of the Board of Editors for the scientific journal Conservation Biology, I supervise the review of numerous scientific articles submitted by leading scientists on the subject of aquatic habitat and fish conservation. I was also principal author of the range-wide status assessment and petition for ESA protection of coho salmon throughout their range in the lower 48 states. I helped gain endorsement of that petition by the largest scientific and professional organization for fishery and aquatic resources in the West, the Western Division of the American Fisheries Society.

My comments are made from the perspective of judging the adequacy of the proposed HCP to protect habitat of coho salmon and other native fish species in the watersheds affected by the plan. Adopting the convention of the National Marine Fisheries Service for implementation of the Endangered Species Act, "protect" means to avoid jeopardy through take of the species through mortality of individuals or loss or alteration of habitat that results in subsequent direct or indirect mortality (e.g., through displacement of individuals to poorer-quality habitat).

In preparing this review I read the relevant portions of The Pacific Lumber Company SYP/HCP Volume II: W atershed an Fish-and-Wildlife Assessments and Volume IV: Habitat Conservation Plans. I also reviewed the material listed in the Literature Cited list and additional background material pertinent to the scientific aspects of the SYP/HCP. My comments below focus on elements of the SYPHCP that I found seriously lacking and also most critical for its effectiveness in protection and recovery of coho salmon and, by inference, other native fish species. CAF-1

1) The SYP/HCP and supporting documents lack a rigorous biological assessment of population viability or probability of persistence under the proposed plan. There is no way to ascertain whether the proposed actions are sufficient to protect and restore existing populations of coho salmon, nor is there even any indication of the present likelihood that coho salmon would persist in the absence of the proposed measures. CAF-2

The complete lack of any formal biological assessment of the viability of

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coho salmon and other species of concern in the planning area is a criticla weakness of the SYP/HCP. Lacking such an assessment, there is no way to guage the sufficiency of the proposed measures for habitat protection for achieving recovery of the coho salmon and other species. How much habitat protection is enough? How fast need restoration of key habitat elements or conditions occur if coho are to be preserved and restored? What is the likelihood coho will go extinct in the planning area if no departure from the status quo in habitat management occurs? These questions are not asked or answered in the SYP/HCP, yet they are fundamental to underpin and assess the environmental effects and biological sufficiency of any such plan. CAF-2 CON.

Based on the sparse and sketchy information about coho salmon distribution and abundance provided in the SYP/HCP (II, 1.4.3 p. 25-32), it appears plausible that coho occur in small and isolated populations within the planning area, occupying only a small portion of the historicaly suitable habitat. Moreover it is not possible to infer whether these small populations are stable, declining, or increasing under present conditions. Given the apparent general trend of decline over recent decades (Brown and Moyle 1993), it is unrealistic to assume that populations are presently stable or increasing, unless data are available to clearly substantiate this. The conservative and prudent biological assumption is that remaining populations are declining or highly vulnerable to further decline. indeed, prevailing evidence of this kind was among the principle reasons for listing of the coho under the Endangered Species Act.

Delayed Impact from Mitigation Measures v. Near-Term Risk to Populations

Many of the mitigation and protection measures proposed in the SYP/HCP would take many years or decades to affect habitat conditions in many streams. For example, road system "stormproofing" is phased in slowly across the planning area and will not occur for 10-20 years in many watersheds, leaving those areas vulnerable to catastrophic impacts from large storms during this interval. Restoration of natural loadings of large woody debris will take far more than a century, and re-establishment of stable channel morphology in highly disturbed or sediment-laden channels will likely take many decades or centuries (Hagans et al. 1986, Platts et al. 1989). This means that the benefits of the such measures will not substantally accrue to the present generation of salmon in the rivers, nor likely in many locations and respects to the next 2-20 generations of salmon. Can the present, highly depleted and fragmented populations survive the next few generations, even though significant improvements in habitat may not occur within that time frame? If not, there will be little or no benefit from long-term habitat recovery because there will be no coho populations left to colonize that habitat. CAF-3 page four

The population bottleneck of the next few years or decades may be crucial to determining the coho's long-term survival, yet in my opinion the SYP/HCP affords little credible chance of anything more than marginal habitat improvement in that time frame. Mitigation measures that might potentially act in the short term either involve 1) foregoing further damage to habitat that would have occurred under prevous practices (e.g., equipment operation in streamside areas) or 2) artificial interventions such as hatchery propagation and instream habitat structures that have shown little evidence of working, and in fact are known to pose a high risk of significant adverse side effects (see below). The main point here is that the plan evinces virtually no formal or defensible assessment of current demograhic conditions and status of the populations in the study area, and the ability of the proposed mitigation measures to substantially affect populations status in the near-term.

CAF-3 CON.

The coho salmon in the study area appears to be distributed in a mosaic of very small, locally adapted breeding populations that respond to changes freshwater habitat predominantly as independent demographic units. The units are defined at the scale of individual coastal river basins, and likely, as with many other migratory salmonids, at the smaller scale of major tributaries and river reaches supporting coho spawning and rearing aggregations. There is little evidence that regional demographic process like straying and recolonization can be expected to overcome the local demogaphic effects of habitat change, at least under contemporary conditions. Therefore conservation of the species must be achieved through the independent protection and recovery of many small and fragmented populations distributed throughout the area affected by the proposed HCP. It is not even established that coho populations are stable and self-sustaining under current habitat conditions and mortality rates. If coho populations are declining or very depressed, as they appear to be, how can we be certain the proposed meaures are adedquate to ensure their recovery? No information is presented to address this key question. The importance of this question is that the risk of additional damage to coho habitat is considerable under the proposed HCP. The question of population viability and persistence under present, proposed, and other alternative scenarios is essential to making a reasoned decision about the degree of risk that managers are willing to accept on behalf of of the coho salmon.

Formal Approaches to Viability Assessment are Available

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Of course one hindrance to such assessments is the serious dearth of valid biological information on coho and other species in the planning area. The information available in the SYP/HCP is sparse, patchy, and not amenable to analysis of temporal trends in population abundance over sufficient time spans (i.e., 20 years or more ideally [Ratner et al. 1997, Botsford and Brittnacher 1998]. In fact the mere presence of coho salmon appears to be a subject of dispute for many stream segments in the planning area. This is shocking and serious oversight given that the precarious status of coho and other species in northern California has been widely recognized for many years. In fact, the lack of basic information on coho distribution and abundance testifies to an attitude of benign neglect on the part of both land and fishery managers in the region. Such data are niether particularly difficult nor expensive to obtain; in fact it is far cheaper to conduct the necessary biological surveys than it is to prepare large and hasty plans and environmental analyses that attempt (unsuccessfully) to circumvent the need for actual biological data. Basd on the few data presented in SYP/HCP, it appears possible, perhaps likely that none of these streams in which salmon spawner surveys have been made presently sustain populations of coho salmon large enough to be considered viable or robust, although one may be marginally viable (Elk River). The proportion of counted coho originating from hatchery stock has not been accounted for, so actual viable wild populations may in fact be smaller than the spawner counts indicate. Hatchery-origin adults may fail to reproduce successfully, or they may interbeed with wild fish their offspring may suffer from reduced fitness (Nickelson et al. 1987, Waples 1991, Hindar et al 1991)

CAF-4

Nevertheless, the situation of limited quantitative biological data is not uncommon for many species in habitat conservation and recovery planning. There are methods available that allow existing biological and habitat information, both qualitative and quantitative, to be formalized and evaluated in conservation assessments (e.g., Ruggiero et al. 1994) and specific recommendations have been provided for salmonid fish species (e.g., Rieman et al. 1993, Lee et al. 1997). No attempt has been made inthe SYP/HCP to adopt such procedures, and no explanation has been provided as to why they were not considered. The rudimentary "assessment" provided in the SYP/HCP adopts none of the conservation biological principles identified in those cited sources and others in the conservation biology literature, and in a fact makes many of the mistakes those authorities warn against (e.g., lack of specificity about why analyses were conducted at the chosen spatial scales, dependence on extrapolation of spatially and temporally limited and error-prone information without considering the risk to the populations of propagating possible errors from various sources).

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2) Inability To Reliably Identify And Mitigate Sites Of Landslide Potential

CAF-5

The ability of the HCP/SYP to achieve recovery and avoid take rests perhaps most crucially on the assumption that the proposed measures are adequate to identify lands prone to increased landsliding as a result of management activity, and to mitigate these impacts by altering activity in landslide-prone sites. The assumption that all landslide-prone sites can be accurately identified using existing maps or new field surveys is not defensible because many critical sites simply cannot be identified prior to disturbance, or are easliy missed because they exhibit faint physical evidence of their proneness to failure. Moreover, the proposed "default" mitigation measures for sites known to be at risk of failure are clearly not sufficient to prevent such failures, especially in that vegetation will apparently be removed through clear-cutting and other timber operations from slopes of recognized high and very high failure potential. The consequence is highly likely to be a continued, accelerated rate of landslide erosion and continuing impacts to downstream salmon habitat as a result of sedimentation caused by road construction and logging activities.

The HCP/SYP Vol. IV, Part D, Section 1 establishes interim standards for mass wasting avoidance, and establishes a process by which site-specific prescriptions will later be developed following watershed analysis. The interim standards or prescriptions include deferral of timber harvest, heavy equipment operation, and road construction in areas identified as "extreme" mass wasting potential (unless these are recommended by a registered geologist and approved by California Dept. of Forestry [CDF]). Areas included in this rule also include inner gorges, headwall swales, and actively unstable slope areas. In other areas rated "high" or "very high" mass wasting potential, removal of vegetation is allowed but heavy equipment and road construction are deferred (unless these are recommended by a registered geologist and approved by CDF).

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Part 3:

Limitations of Slope Stability Assessments Must be Disclosed and Addressed

CAF-6

The first problem with this strategy is that it fails to recognize clear technical limitations on our ability to accurately identify slopes that are vulnerable to failure as a consequence of logging and road construction. Although it is clearly possible to zone and map the landscape with regard to mass failure risk, such assessment procedures ordinarily recognize that areas of moderate to low failure potential are not areas of zero landslide risk. In fact these areas include a significant number of sites that are prone to fail if disturbed. They are simply distinguished by having a lower density of such sites, and/or a higher incidence of sites whose vulnerability to management disturbance is questionable or highly uncertain. Disturbance of a large area of moderate or low mass failure risk can, and often does, generate significantly large numbers of management-related landslides. The HCP/SYP ignores the fact that significant residual landslide risks occur in areas mapped as moderate- and low-hazard for mass wasting.

Landslides Occurring in Low- and Moderate-Risk Areas May be Disproportionately Important, but there is no Provision for their Avoidance

Why are management-induced landslides in moderate- and low-risk areas important, even if they are not overwhelming in size and number? Often these events occur in portions of the drainage where natural landslides have been especially infrequent, and as a result, the effects of management-induced failures on streams may be more biologically significant than would the same landslides occurring in a portion of a drainage experiencing high background rates of natural landsliding. Based on my considerable field experience in coastal Oregon and Washngton, and my assessment of numerous, widely-available data sets from systematic surveys of coastal coho distribution conducted by several agencies, it is clear that coho salmon are often strongly associated with and dependent on these so-called "refuge areas" (Reeves et al. 1995, Frissell and Bayles 1996) where the occurrence of natural landslides and debris flows has been relatively infrequent in recent decades. These are typically the locations of so-called "core populations" whose density is moderate to high and where page eight

numbers of returning adults are relatively consistent from year to year and over the decades. Such populations are likely of major importance in the long-term, regional persistence of coho salmon in coastal drainages. it is important to reconize that in coastal watersheds , it often only takes a single small landslide to generate a long-runout debris flow or hyperconcentrated flood flow that can damage or destroy coho populations and habitats for many miles (examples for the planning area are graphically documented in DFG 1997, DMG 1997, PWA 1998a, 1998b; a general treatment of debris flow runout phenomena is provided in Benda et al. 1998).

CAF-6 CON.

Thus, human-triggered landslides in these watersheds, even if they are of small account in terms of the overall sediment budget of the whole river basin or coastal region, can be of extreme importance to coho persistence and recovery. The HCP/SYP does not evaluate the occurrence of existing coho salmon populations relative to the spatial location of landslide-prone areas, and utterly fails to account for potential cumulative effects of logging and roads on landslides and streams in watersheds with large areas of moderate- and low-risk mass wasting potential (which will receive essentially no protection from landslide-triggering activities and are slated for extensive logging). These issues of spatial allocation of risk from human disturbance are not new, and have for some years served as a rational and necessary basis for landscape assessment and planning for conservation of aquatic species, including salmon in the coastal region (e.g., Reeves and Sedell 1992, Frissell 1992, FEMAT 1993, Frissell and Bayles 1996, Frissell et al. 1997). It is not clear why the SYP/HCP has ignored this issue. The authors appear to have adopted an implicit assumption that their proposed mitigation measures reduce the risk of erosion and sedimentation-related habitat damage to a vanishingly small level.

The assumption that all landslide-prone sites can be accurately identified using existing maps or new field surveys is not defensible; many mass-failure-prone sites simply cannot be identified until after site disturbance. Pacific Lumber Company's own geological consultants have underscored this fact in their assessments of landslide occurrence on PLCo lands. For example, in their investigation of sediment sources in the North Fork Elk River, Pacific Water Associates (PWA 1998b, p. 22) states that "Unfortunately, there is little indication from the preliminary aerial photo analysis that large and very large landslides occur in unique settings...That is, aside from their occurrence in lower and streamside slopes, large landslides do not appear to occur in any particular location...They develop on slopes from 40% to 70% steepness....Such slopes (>50%) are very common in the watershed, covering over 40% of the landscape of the North Fork." The authors point out that timber harvest effects on landslides in the North Fork Elk River are obscured by the long history of logging by railroads and roads prior to the most recent logging entries, page ten

risk of managementrelated landslides occurring is the sum of many low-to-moderate, site-specific probabilities. When large areas are disturbed, the probability of some management-related failures occurring rapidly approaches near-certainty.

CAF-6 CON.

The likelihood or incidence of error of geotechnical analysis, that is, the incidence of landslide occurrence or acceleration despite that a field inspection has occurred, recommendations made, and mitigation measures employed, can be quantified based on past experience. The HCP/SYS fails to disclose that these mitigation measures are inherently and unavoidably error-prone and that a consistent rate of failure will foreseeably occur as a result of these three categories of error (identification, diagnosis and prescription of mitigation measures, and implementation of mitigation measures). The virtual certainty of error is the case even if the best possible geotechnical analysis could be done in every case, fail-safe prescriptions could be developed, and these faithfully applied in every situation.

Development and Implementation of Prescriptions from Geotechical Analysis is Imperfect

CAF-7

Of course, perfection in these tasks is far from the rule. For example, geotechnically-based prescriptions conducted for PLCo. in the past 2 years have consistently failed to accurately identify and prescribe mitigation (e.g., full vegetation retention and road avoidance) for the more extensive slope zone that contributes runoff to a failure-prone site, and have sometimes failed to recognize that partial vegetation removal) e.g., selective logging or yarding damage) can reduce slope stability (Reid 1998a, 1998b, 1998c). These are in fact typical failings in the many site-specific geologic and geotechnical analyses I have reviewed over the years in Oregon, Washington, California, Idaho, and Montana. They appear to result from inadequate training and often outdated knowledge on the part of registered professionals who are licensed to conduct the work, as well as their tendency to succumb to relentless pressures and unreasonable burdens of proof exerted by their employers, who are land managers usually intent on building roads and cutting timber. My opinion in this regard is based on my own research experience over many years in the coastal region, and also on experience and opinions of on the experience and observations of many of my colleagues who are experts in this rapidly-evolving scientific field. These shortcomings do not even begin to address the many mistakes that are inevitably made in the management and field implementation of multiple complex , site-tailored prescriptions that togther blanket large portions of the landscape.

Although I agree that faithful application (far more professionally

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competent that has been exhibited in PLCo. management to date, based on the cited record!) of the prescribed procedure for landslide risk reduction could reduce the incidence management-induced landslides over that seen in the immediate past (per road mile or area logged), that still provides no guarantee either that such sources of erosion will be reduced to zero, as implied in the SYP/HCP, or that the net rate of management-induced landsliding on a watershed basis will decrease. In fact, as road miles and area logged increases over time, it remains virtually inevitable under the SYP/HCP that net rates (or risks) of landsliding will increase above present rates (or risk) in many watersheds important to coho salmon. CAF-7 CON.

Consequences of Landsliding Are not Reversible through Management Intervention

There will be management-related landslides as long as management activity continues. One more crucial question remains unresolved: is a somewhat lower level of landsliding, relative to the extremely high levels seen in the past several decades, sufficient to achieve protection and recovery of habitat and salmon populations? That question has not been addressed in the SYP/HCP and associated documents. Previous research and field studies that address this question suggest that the answer is complex, but in general, streams that have been heavily loaded with sediment in prior erosion episodes remain highly sensitive to adverse responses to even small increments of additional sediment input (Coats et al. 1985, Platts et al. 1989, Frissell 1992). Continued inputs of sediment can easily change the trajectory of such a stream from that of slow recovery to one of additional, net deterioration and greatly delayed recovery of the physical conditions necessary for fish habitat. CAF-8

Landslides cause changes in streams that are essentially irreversible by human means; their adverse effects to fish and fsh habitat can be at best be only partly ameliorated (Frissell and Nawa 1992, Frissell et a. 1997, Frissell and Ralph 1997), and recovery trajectories may be very, very slow or frequently arrested (Coats et al. 1985, Platts et al. 1989, Lisle 1982, Hartman and Scrivener 1990, Ziemer et al. 1991, Frissell 1992, Frissell et al. 1997). The only effective means of protecting streams from damage by landslides is to a priori prevent management-induced landslides from occurring. This requires dramatic departures from the way we have managed the landscape in the past, in order to minimize the likelihood of error and to ensure that when an episode of mass erosion occurs, its effects will not be devastating. Post-hoc management responses, once an episode of landsliding has already occurred, are not effective. The SYP/HCP Part H (p. 8-9) identifies the occurrence of a single landslide "that causes, or is likely to cause significant alteration of stream habitat condition" as a "Changed Circumstance" or "Unforeseen circumstance," depending on the magnitude of the perceived effect. The

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document states this occurrence will be trigger an "expedited watershed analysis." This post-hoc response is not a credible or effective mitigation scheme for landslide impacts. Moreover, the effects of landslides are typically cumulative, lasting many decades and involving the interacting effects of numerous landslide events occurring at different locations across a basin (Ziemer et al. 1991, Spence et al. 1996, Reid 1997, Frissell et al. 1997). Moreover, only rarely will a single landslide trigger such a response in the stream system. Rather, the response will be triggered by an episodic occurence of many landslides during a large triggering storm event--the catastrophic consequence of natural landslides plus the management-induced risk accumulated as individual sites were altered by logging to become more vulnerable to landsliding.

CAF-8 CON.

The notion that "The outcome of watershed analysis will be development to the extent practicable the occurrence of sediment inputs that could accumulate with the landslide event" (SYP/HCP Vol. IV, Sec. H, p. 9) is nonsense when the only effective remedy is treatment, rather than prevention. Watershed analysis, no matter how perfectly executed, cannot make up for a plan that simply fails to minimize the human contribution to landslide occurrence and at the same time fails to anticipate and develop a rational management strategy that hedges against the likely consequences of natural landslide events before these irreversible events occur (Frissell and Bayles 1996).

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